AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Appln. No. 09/851,779

REMARKS

Claims 27-57 are all the claims pending in the application.

Claims 34 and 36 are objected to for depending upon a cancelled claim. Applicants have changed the dependency of these two claims.

Claims 36-40 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite. The above amendment to claim 36 addresses this rejection.

Claims 27-29, 31, 34, 36-40 stand rejected under 35 U.S.C. §103(a) as being unpatentable over USP 4,595,289 to Feldman et al. Claims 32-33, 35, 43-50, and 55 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Feldman in view of USP 5,892,579 to Elyasaf et al. Claims 51 and 56 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Feldman in view of Elyasaf and further in view of USP 6,124,924 to Feldman et al. (Feldman '924). Applicants respectfully traverse these rejections, and request reconsideration and allowance of the claims in view of the following arguments.

The present invention relates to aerial imaging. Independent claim 27 recites, among other things, an image processing module that detects variations in line width of a first die. Independent claim 41 recites, among other things, a scanner that acquires aerial images of a reticle in reflected light. Independent claim 43 recites, among other things, a numerical aperture diaphragm. As Applicants will discuss below, the prior art that the Examiner has cited fails to teach or suggest any of these claimed combinations.

Purely by way of example, looking at one embodiment shown in Fig. 1 of the present application, a moving stage 2 moves a reticle 1 to have the reticle 1 scanned in a serpentine

manner. The bottom surface of the reticle 1 is illuminated by light from a light source 3 via a transmission light illumination system (including a homogenizer and illumination optics 5, an illumination aperture 7, and a condenser 6). An objective 10 collects the light transmitted by the reticle 1. The light then passes through a collecting adjustable numerical aperture diaphragm 12, a lens 13, and a zoom magnification lens 14. A beam splitter 15 splits the beam to produce three images of the reticle 1. The three images of the reticle 1 in the transmitted light are simultaneously acquired by a first focus camera 16, a second focus camera 17, and a third focus camera 18. Cameras 16-18 are at different focal conditions. Thus, for every field of view, three images are acquired at three different focal planes. The objective 10 also collects the light reflected by the reticle in the dark field illumination operating mode. An image processing module receives from the scanner two to three aerial images from different focal points, and a dark field reflection image. Errors in line width are detected by comparing die to die images from the same focal plane, and surface defects are detected by comparing the dark field reflection image of the reticle to the transmission image of the same reticle.

Feldman provides a method and an apparatus for inspecting lithographic masks and reticles used in the fabrication of the wafers and/or for inspecting the wafers themselves. As shown in Fig. 4 of Feldman, sources 20 and 22 and associated lens assemblies 24 and 26 provide incident light propagated perpendicular to the plane of the underside of a mask 10 in a bright-field mode. Light transmitted through the illuminated patterned areas of the mask 10 is collected by lens assemblies 28 and 30. The collected light is focused onto standard photodetector arrays

32 and 34. The signals provided by the arrays 32 and 34 are compared and processed in a standard signal processor and minicomputer unit 36.

In a dark-field mode, sources 60 to 63 and respectively associated lens assemblies 66 through 69 serve to illuminate corresponding portions of two chip patterns on a mask 10. In the dark-field mode of Feldman, the angle θ at which light is directed at the mask is selected to be in the range of 0 to 75 degrees. Accordingly, only light scattered from illuminated edges of a feature or defect contained within the resolution element of the viewing optics is collected (Feldman, col. 6, lines 8-16). No aerial image of the reticle in the reflected light is acquired.

Elyasaf provides an optical inspection method to detect the presence or absence of defects in both the clear areas and the opaque areas of a photomask. As shown in Fig. 1 of Elyasaf, light from a first light source 4 is directed to one side of a photomask PM via an optical system 6, a beam splitter 8, and an objective lens 10. Light from a second source 12 is directed by a reflector 14 and an optical system 16 to the opposite side of the photomask. An area-type image sensor 20 receives, via a relay lens 18, light from the light source 4 and reflected from one face of the photomask and light from the light source 12 and transmitted through the photomask.

Feldman '924 provides a focus error correction apparatus. As shown in Fig. 3 of Feldman '924, three lens arrangements 30, 32 and 34 of an imaging optics 8 define a common optical axis OA_2 of light propagation. A plate 35, having a pair of slits 35a and 35b, is interposed between the lens arrangements 30 and 32, and is oriented perpendicular to the optical axis OA_2.

Claim 27 of the present application recites an apparatus for inspecting a multiple die reticle comprising a scanner for acquiring a plurality of aerial images of the multiple die reticle under a set of exposure conditions; and an image processing module for detecting variations in line width of the first die. The purpose of Feldman is to raise the ratio of defect signal-to-misalignment signal to detect smaller defects. Feldman does not teach or suggest detecting variations in line width of the first die. Neither Elyasaf nor Feldman '924 supplies deficiencies of Feldman. Accordingly, Applicants respectfully submit that claim 27 and its dependent claims 28-40 are patentable.

Claim 41 recites an apparatus for inspecting a reticle comprising a scanner for acquiring a second plurality of aerial images of the reticle in a reflected light. As provided above, in the dark-field mode of Feldman, only light scattered from illuminated edges of a feature or defect contained within the resolution element of the viewing optics is collected (Feldman, col. 6, lines 8-16). No aerial image of the reticle in reflected light is acquired. Neither Elyasaf nor Feldman '924 teaches or suggests scanner for acquiring aerial images of the reticle in a reflected light. Thus, claims 41 and 42 are patentable.

Claim 43 recites an apparatus for inspecting a multiple die reticle comprising optical means having a numerical aperture diaphragm for reproducing the set of exposure conditions. None of Feldman, Elyasaf and Feldman '924 teaches the recited numerical aperture diaphragm. Thus, claim 43 and its dependent claims 44-57 are patentable.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the

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Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that this AMENDMENT UNDER 37 C.F.R. § 1.111 is being facsimile transmitted to the U.S. Patent and Trademark Office this 26th day of October, 2004.

Thea K. Wagner